January 2006

FAIRCHILD
SEMICONDUCTOR®

QFET TM

FQB3N60C

600V N-Channel MOSFET

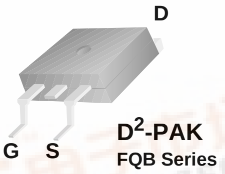
Features

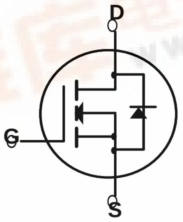
- 3A, 600V, $R_{DS(on)}$ = 3.4Ω @V_{GS} = 10 V
- Low gate charge (typical 10.5 nC)
- Low C_{rss} (typical 5 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.





Absolute Maximum Ratings

Symbol	Parameter	FQB3N60C	Unit
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current - Continuous (T_C = 25°C) - Continuous (T_C = 100°C)	3 1.8	A A
I_{DM}	Drain Current - Pulsed (Note 1)	12	A
V_{GSS}	Gate-Source voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	150	mJ
I_{AR}	Avalanche Current (Note 1)	3	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	7.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation (T_C = 25°C) - Derate above 25°C	75 0.62	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.67	°C/W
$R_{\theta JA}$*	Thermal Resistance, Junction-to-Ambient*	--	40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

* When mounted on the minimum pad size recommended (PCB Mount)

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQB3N60C	FQB3N60CTM	D2-PAK	330mm	24mm	800

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	600	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	--	0.6	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V V_{DS} = 480V, T_C = 125°C	-- --	-- --	1 10	μA μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30V, V_{DS} = 0V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30V, V_{DS} = 0V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 1.5A	--	2.8	3.4	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 1.5A (Note 4)	--	3.5	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	--	435	565	pF
C_{oss}	Output Capacitance		--	45	60	pF
C_{rss}	Reverse Transfer Capacitance		--	5	8	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 300V, I_D = 3A R_G = 25Ω (Note 4, 5)	--	12	34	ns
t_r	Turn-On Rise Time		--	30	70	ns
$t_{d(off)}$	Turn-Off Delay Time		--	35	80	ns
t_f	Turn-Off Fall Time		--	35	80	ns
Q_g	Total Gate Charge	V_{DS} = 480V, I_D = 3A V_{GS} = 10V (Note 4, 5)	--	10.5	14	nC
Q_{gs}	Gate-Source Charge		--	2.1	--	nC
Q_{gd}	Gate-Drain Charge		--	4.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	3	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	12	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 3A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_S = 3A dI_F/dt =100A/μs (Note 4)	--	260	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.6	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 3A, V_{DD} = 50V, L=30mH, R_G = 25Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 3A, di/dt $\leq$ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C
4. Pulse Test: Pulse width $\leq$ 300μs, Duty Cycle $\leq$ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

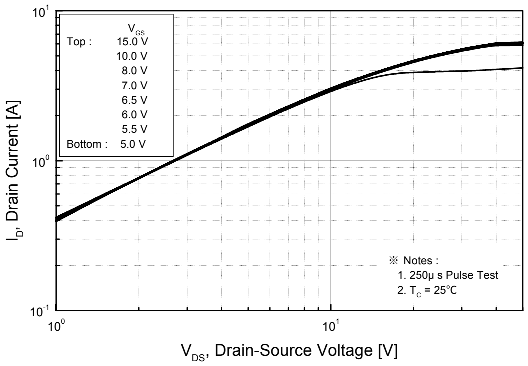


Figure 2. Transfer Characteristics

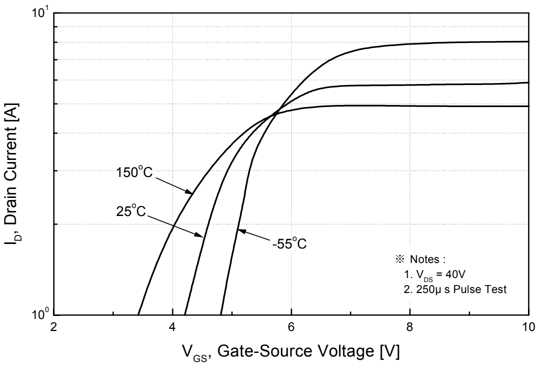


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

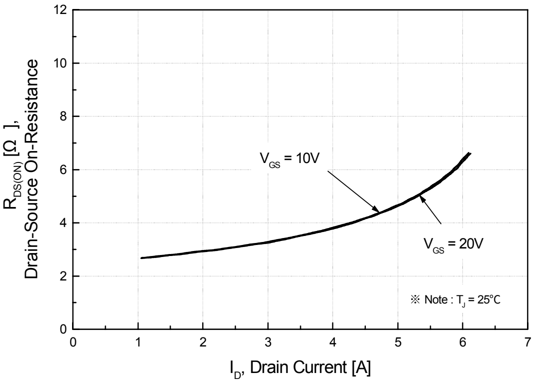


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

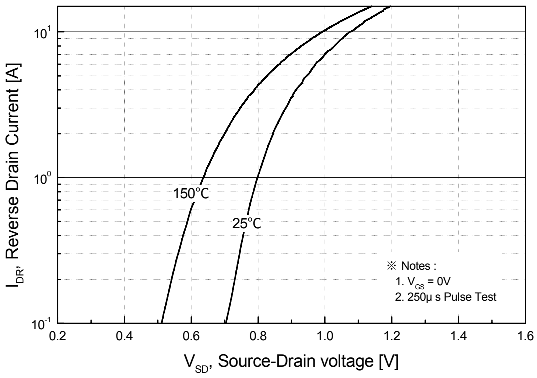


Figure 5. Capacitance Characteristics

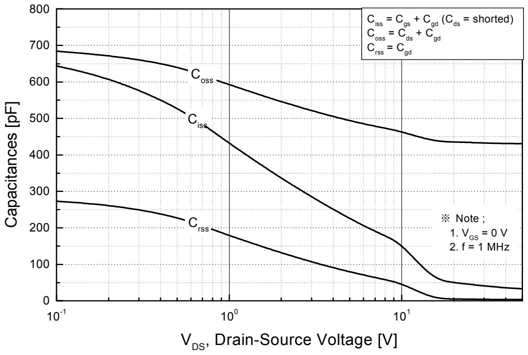
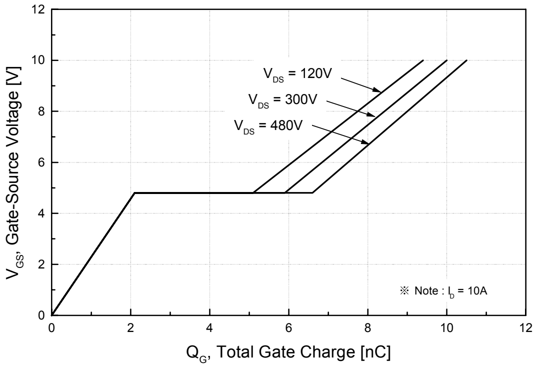


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

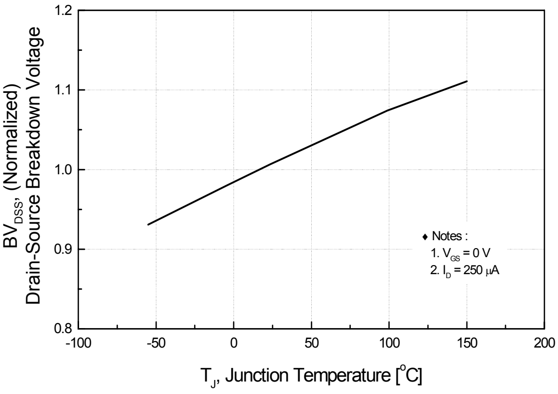


Figure 8. On-Resistance Variation vs. Temperature

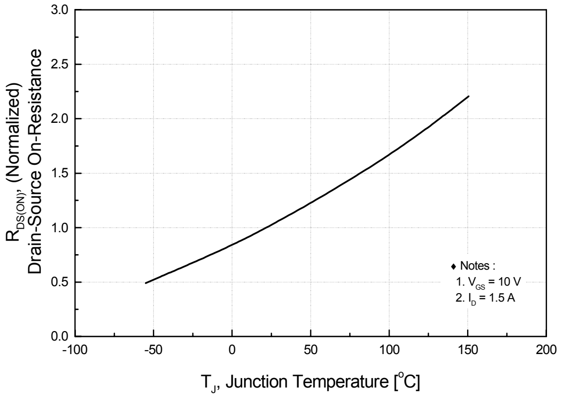


Figure 9. Maximum Safe Operating Area

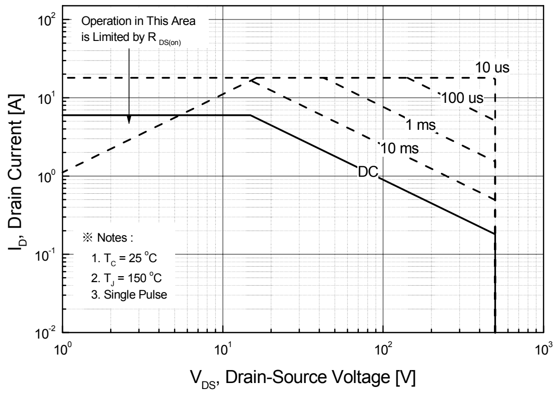


Figure 10. Maximum Drain Current vs. Case Temperature

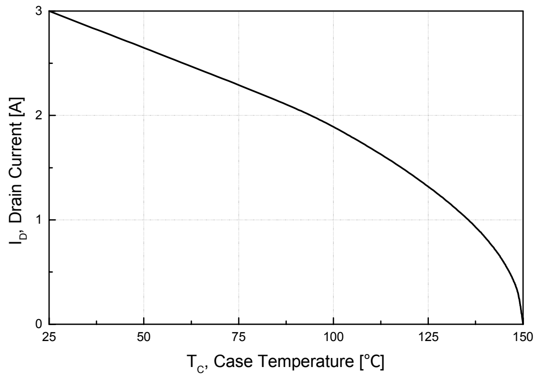
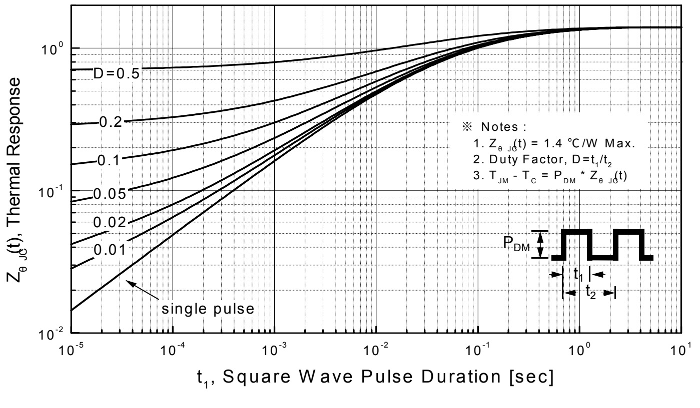
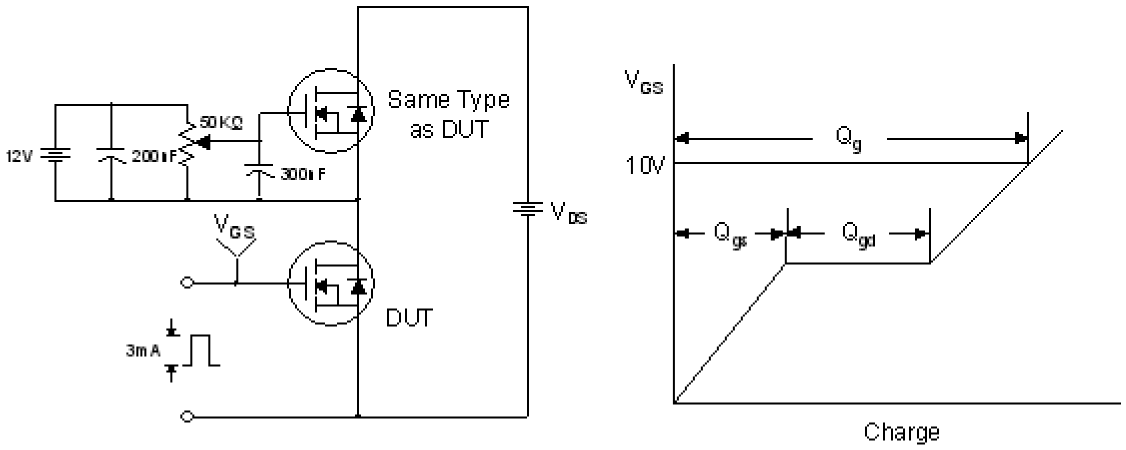


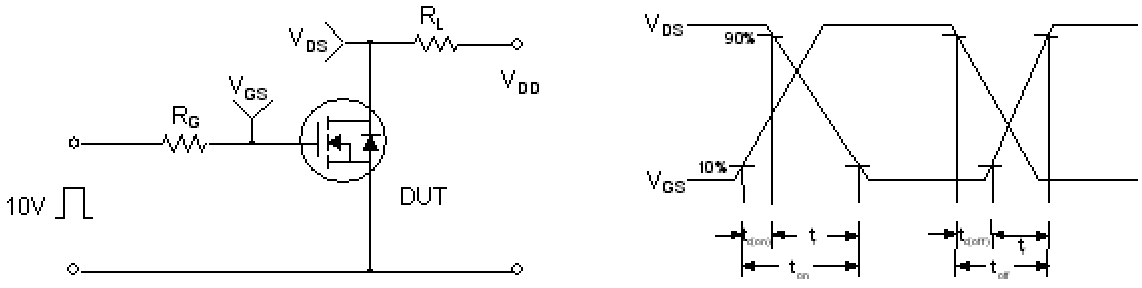
Figure 11. Transient Thermal Response Curve



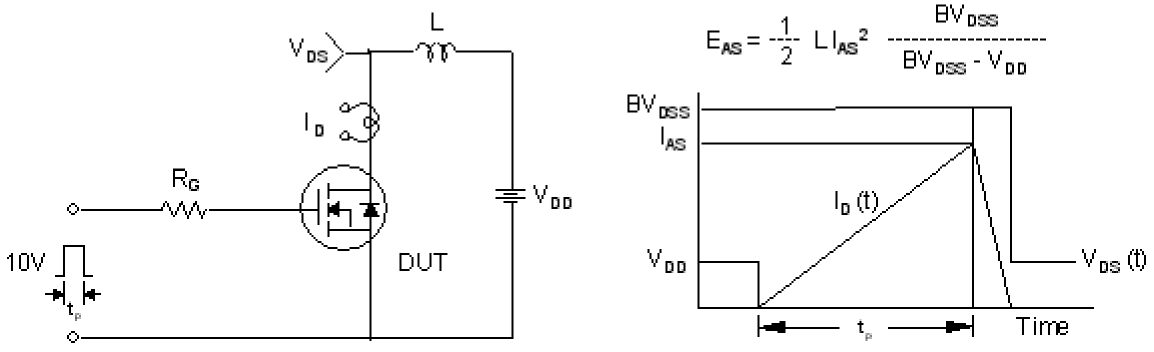
Gate Charge Test Circuit & Waveform



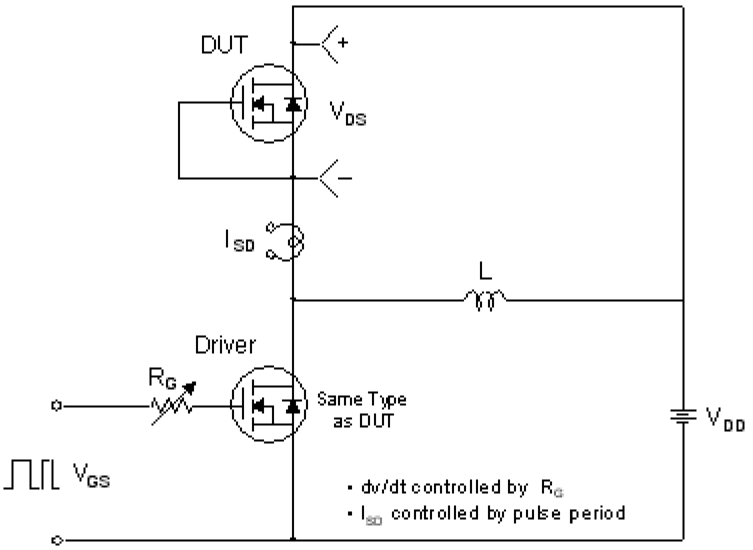
Resistive Switching Test Circuit & Waveforms

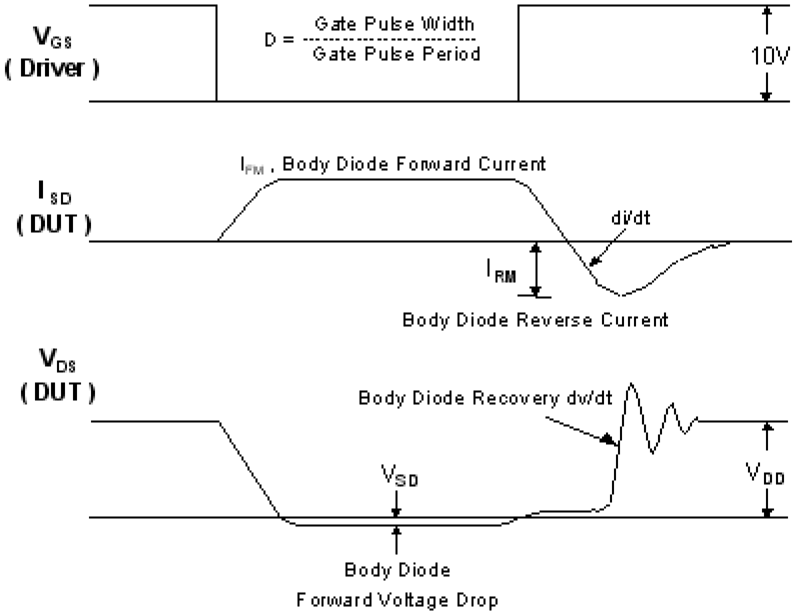


Unclamped Inductive Switching Test Circuit & Waveforms



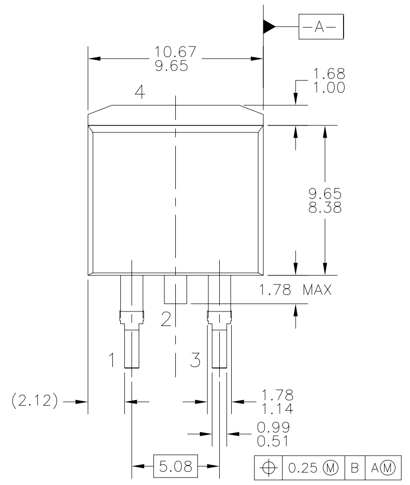
Peak Diode Recovery dv/dt Test Circuit & Waveforms

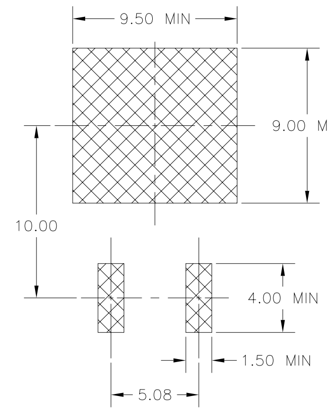




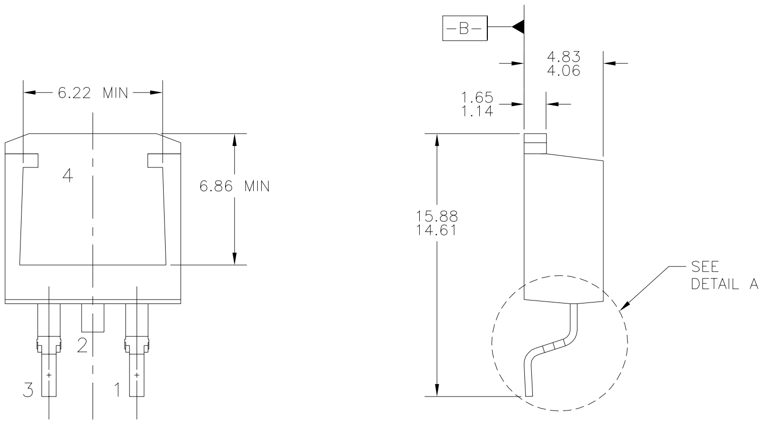
Mechanical Dimensions

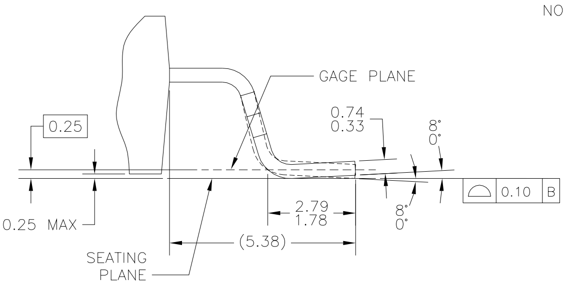
D2-PAK





LAND PATTERN RECOMMENDATION





DETAIL A, ROTATED 90°
SCALE: 10X

NOTES: UNLESS OTHERWISE SPECIFIED
- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) REFERENCE JEDEC, TO-263, ISSUE D, VARIATION AB, DATED JULY 2003.
- C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M – 1982.
- D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
- E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.

TO263A02REVD

Dimensions in Millimeters

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Rev. I18